The Impact of current Climate and Energy Policies on the Public Budget of EU Member States

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The Impact of current Climate and Energy Policy Instruments on the Public Budget of EU Member States

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1. Introduction

Fighting and adapting to climate change requires huge amounts of resources as well as changing the behaviour of public policy makers and those of citizens. Public policy makers have the key role in this process to efficiently and fairly collect resources, finance adaptation and mitigation measures, support R&D investments and coordinate efforts towards new technology.[1] Governments can use a number of different types of instruments to reach environmental goals and they can roughly be classified into regulatory instruments and market based instruments.[2] They differ in several respects, such as efficacy, efficiency, impact on prices, on social welfare and on economic activity. Above these economic objectives, political acceptability has proved to be an essential point in order to understand why an economic instrument is effectively implemented.[3] Moreover, an often undervalued feature, strictly linked to political acceptability, can be added: the impact of instruments on the public budget. Market based instruments, in the majority of cases, impact the budget balance although with different intensity. Taxes and charges always generate revenues, while tradable permits can generate revenues when they are auctioned by public authorities. However, all instruments have at least an indirect impact on budget outlays or revenues: regulation in the form of standards can imply loss of profits for the industries affected and this can lead to a decrease in corporation income tax revenues; tax credits or abatements can reduce tax rates. Moreover, regulation can imply extra costs to the general government expenditure.

In this paper, an overview of the evidence on current environmental policy instruments that can be identified in the Budgets of EU 27 Member Countries is provided.[4] Unfortunately, quantifying environmental revenues and subsidies is not an easy task and the evidence is necessarily incomplete. The analysis focuses on energy related public expenditures and revenues, as they are directly linked to the implementation of the EU climate package, although there are several relevant links between environmental instruments and all the other items in the public budget.

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[1] The central role of public policy to promote green technologies clashes with growth models. See, among others, Aghion et al. (2009).

[2] For an overview of environmental instruments see Perman et al. (2003).

[3] See the 2006 special issue of Energy Policy on Social and political responses to ecological tax reform in Europe. Moreover, see, Buchanan and Tullock (1976), it has been widely accepted that firms prefer regulation to taxes and for this reason policy makers tend to choose command and control instruments.

[4] This paper constitutes background work for the project The Impact of Climate and Energy Policy on the Public Budget of EU Member States developed by Think Tanks. See http://www.euci.eu/TPRINJK/Home.aspx for further information on the project.

After reviewing environmental taxation trends (section 2) and subsidies (section 3), the paper discusses the links between the need for public resources and the current public finances situation, where Member States governments are being forced to make significant fiscal efforts to stabilise public debt (section 4).

1. Environmental taxation and Emissions Trading Scheme

Much support for market-based instruments is found in European policy (and in the Kyoto Protocol) as opposed to the traditional command and control approach[5]. Environmental taxes and the market for tradable emission permits are the means of setting a price for carbon with the aim of including all the external costs and benefits in the right signals for market behaviour. While the European Carbon Trading Scheme represents a major success of recent European policy, no comparable success has been achieved in the tax area and, despite several efforts to design a European Carbon Tax, supranational environmental taxation still lacking in the EU. This is due to all European countries' autonomy under the energy tax directive[6], which sets minimum levels of taxation for some energy products in order to avoid harmful fiscal competition. The following paragraphs focus on environmental and energy taxes[7], the data for which are generally available and comparable across countries.

From 1998 to 2004, the share of environmental taxes out of total taxation showed minor changes, after what has been a declining trend, showing a peak in 1999 (the EU-27 ratio was 7% and it gradually decreased to 6.1% in 2008). However, in this EU-27 trend some country experiences are quite extreme examples[8].

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[5] According to OECD (1997), economic instruments are defined as "those policy instruments which have influence environmental outcomes by changing the costs and benefits of alternative economic activities in order to encourage people and firms to more closely assess their own best interests and, ultimately, to pay to treat the environment as what it is in the best interests of society". See also Green Paper on Market-Based Instruments, European Commission (2007).

[6] Directive 2003/96/EC

[7] Eurostat uses the following definition for environmental taxes: "A tax whose tax base is a physical unit (or a proxy of it) of something that has a proven, specific negative impact on the environment" (Jarass and G. Obermair, 1996). Environmental taxes are usually classified in five main groups (Energy, Transport, Resource and Pollution) according to Eurostat guidelines (Eurostat, 2001).

[8] For instance, while the total environmental taxation out of total taxation increased from 9,4% in 1998 to 7,9% in 2001, but it remained almost stable from 2002 to 2005 (with ratios ranged between 8,1% and 8,3%). Estonia, on the contrary, was characterized by a steadily increase from 1995 onwards, reflecting the need to adjust excises up to the EU minimum rates, and specific policy implementation of finance cuts in personal income taxes.

Graph 1: Share of environmental tax revenues out of total taxation: the EU 27 trend (1992-2008)

Source: European Commission Taxation and Customs Union (2011)

The importance of environmental taxes varies significantly among Member States. The situation in 2008 is depicted in graph 2. It shows relatively high ratios in the Netherlands, where the share of revenue from environmental taxation out of total taxation was 9.9%, and in Malta, where environmental taxes generated 10.2% of total revenue especially due to the high level of Transport tax. The highest ratio was recorded in Denmark, where it reached 10.9%, 5.8 percentage points above the EU 27 average (6.1%).
Finland, Romania, Latvia, the UK, the Slovak Republic, Luxembourg, Hungary, Estonia, Cyprus, Slovenia and Ireland formed another group of countries with a relatively high contribution of environmental taxes to total revenue from taxes and social contributions, with ratios above 6.2%. Conversely, Member States that stand below the EU 27 average are Greece, Germany, Italy, Austria, France, Spain and Belgium. Germany and Italy, the contribution of environmental taxes to total taxation revenues (5.7%) while in France and Spain it remains significantly below the EU 27 average (4.9%). Belgium is the EU 27 country with the lowest ratio (4.4%). In terms of the relationship between environmental taxes and GDP, the findings are similar.

Graph 2: Environmental tax revenue by aggregate tax category as percentage of total taxation (2008)

Source: European Commission Taxation and Customs Union (2011)

In almost all Member States, a strong concentration of environmental taxes is the field of energy taxes observed: 2008, energy taxes accounted for 74.4% of total tax revenue in EU 27 and for almost 73.2% of the total revenue from environmental taxes.

2.1 Energy taxes

As showing graph 3, Denmark and Malta are the only EU countries where energy taxes generate less than 50% of total revenue from environmental taxes. Conversely, Luxembourg and the Slovak Republic have the highest share of total revenue from environmental taxes (93% and 90% respectively).

Graph 3: Environmental taxes by category, 2008

Source: Taxation and Customs Union (2010).

Cyprus is the only EU country where revenue collected through transport taxes were close to those collected via energy taxes, presenting 50% of the environmental tax art. Significant contribution from transport taxes (more than 30%) are observed in Austria, Denmark, France, Iceland (due to heavy vehicle taxation), Greece, Latvia, Malta, and the Netherlands. The role of pollution taxes is marginal in most Member States.

The aforementioned low share of environmental taxes out of total revenue is mainly linked to a decrease in energy taxation. Graph 4 shows that the implicit tax rate on energy (calculated as energy taxes over energy consumption) steadily increased, culminating in 2008.

Graph 4 Implicit tax rates on energy in EU 27[9]

Source: European Commission, Taxation and Customs Union (2011)

However the picture changes if the evolution over time is considered, where the implicit tax rate on energy has declined in real terms after 2000, revenues increased as a share of GDP.[10] This is due to the fact that energy taxes are excises and a constant monetary tax rate corresponds to a decreasing effective tax rate[11].

Graph 5 illustrates the simple range of total energy implicit tax rates of member states for 2008: implicit tax rate in Romania is a result of that prevailing in Denmark. This variation is connected to different minimum tax rates for different energy mixes and to different tax exemption regimes.

Graph 5 Implicit tax rates on energy (2008)

Source: European Commission (2010)

[9] Europe tonne of oil equivalent (TOE)

[10] Implicit tax rates are computed as energy taxes in Europe tonne of oil equivalent (TOE) to base year 2000. The increase in the nominal implicit tax rate is partly preceded by stationary energy consumption.

[11] However it is important to stress that energy taxation in the supply chain does not include VAT on energy products. VAT tax on energy increases if energy prices increase.

This high dispersion of implicit tax rates sample reflects the non-effective focus of most taxes on pricing. Only a sufficiently high and long-term stable policy signal would be an incentive for private R&D in new green technologies, energy saving and emission reducing investment[12].

A common characteristic of EU Member States' energy tax policies is that energy-related revenues are highly concentrated on fossil products. Table 1 shows that taxes on fossil fuels represent on average 90% of total energy taxation. Exceptions are Denmark, Germany and Sweden where taxes on electricity or nuclear power have a noticeable importance.

Table 1
Energy taxes and fossil fuels share (2008)

		Energy Taxes				
	Energy Taxes Environ Taxes	Total Mineral Oils	Natural Gas	Coal and Coke	Electricity	Total
BE	6.3%	96.9%	1.3%	0.8%	1.1%	100.0%
BG	8.7%	98.6%	0.0%	0.3%	1.2%	100.0%
CZ	9.3%	97.1%	1.2%	0.5%	1.2%	100.0%
DK	3.7%	58.1%	11.4%	4.4%	26.1%	100.0%
DE	8.2%	81.6%	4.6%	0.0%	13.8%	100.0%
EE	8.4%	91.8%	1.9%	0.0%	6.4%	100.0%
IE	5.2%	100.0%	0.0%	0.0%	0.0%	100.0%
EL	6.0%	100.0%	0.0%	0.0%	0.0%	100.0%
ES	8.0%	90.7%	0.0%	0.0%	9.3%	100.0%
FR	6.8%	99.0%	1.0%	0.0%	0.0%	100.0%
IT	7.8%	85.4%	9.3%	0.2%	5.1%	100.0%
CY	5.0%	100.0%	0.0%	0.0%	0.0%	100.0%
LV	8.5%	99.6%	0.0%	0.2%	0.3%	100.0%
LT	9.3%	99.8%	0.0%	0.2%	0.0%	100.0%
LU	9.3%	99.2%	0.5%	0.0%	0.3%	100.0%
HU	7.3%	94.7%	4.2%	0.0%	1.1%	100.0%
MT	4.3%	98.2%	0.0%	0.0%	1.8%	100.0%
NL	5.0%	64.0%	23.3%	0.1%	12.6%	100.0%
AT(*)	6.8%	84.6%	15.4%	0.0%	0.0%	100.0%
PL	8.7%	89.8%	0.0%	0.0%	10.2%	100.0%
PT	7.3%	100.0%	0.0%	0.0%	0.0%	100.0%
RO	7.9%	97.3%	1.6%	0.1%	1.0%	100.0%
SI	7.9%	98.8%	0.4%	0.0%	0.8%	100.0%
SK	9.0%	99.2%	0.4%	0.0%	0.3%	100.0%
FI	6.5%	82.3%	2.6%	1.7%	13.4%	100.0%
SE	8.0%	68.8%	1.1%	0.4%	29.8%	100.0%
UK	7.4%	97.9%	2.1%	0.0%	0.0%	100.0%

(*) Gas figure includes coal and electricity
Source: Eurostat Taxation Trends and European Commission Energy Duties Revenue

[12] For an analysis of the effects of environmental taxation on innovation see OECD (2010).

The high share of fossil fuels reflects the idea of taxing the most damaging products,[13] but at the same time shows the need for structural reforms in the climate package if it wants to achieve its goal of fossil fuel revenues will decrease as a percentage in the next ten years.

2.1.1 Energy tax rates in EU-27

Generally speaking, tax rates on high carbon energy products are expected to be higher than on other consumer goods in light of both revenue and environmental considerations (see Crawford, Keen, and Smith 2008). Countries may set different tax levels according to estimations of local marginal damage, revenue requirements, concerns about income distribution, industry competitiveness. However, the level of differentiation in energy taxes and its role in the level playing field, so in order to reduce the incentive for tax competition (which damages the climate change policy), a minimum of tax harmonization has been implemented in the EU.

The Energy Taxation Directive of 27 October 2003 (Directive 2003/96/EC) is the Community approach for the taxation of energy products. This directive revised the scope of the former EU energy taxation framework, which was defined under the Mineral Oils Directive (Directive 1992/82/EEC), bringing the system of minimum rates of taxation, previously to commercial oils, to coal, natural gas and electricity.[14] The system sets the minimum rates[15] of taxation applicable to energy products used as motor or heating fuels and electricity. However, the Directive allows Member States to differentiate between business and non-business use of energy products, by way of derogation from the provisions of the directive, to commit to apply certain exemptions or reductions in the level of taxation (See Box 1 for details). It aims to reduce distortions that exist between Member States and between mineral oils and other energy products which had not been previously subject to EU take-gisbaji, in order to improve the operation of the internal market.[16]

Box 1 Minimum level of taxation and exemptions.

The following table shows the minimum level of taxation applicable to motor fuels set by the Energy Taxation Directive compared to the minimum levels imposed by the Mineral Oils Directive 1992.

Minimum levels of taxation applicable to heating fuels and electricity.

	Previous Minimum	New Minimum Excise	New Minimum Excise

[13] Ideally, environmental taxes should represent the marginal damage caused by producing or consuming a given product. After the taxe, energy prices reflect the whole cost for society (social costs). However, in practice social costs are difficult to evaluate and tax rates respond frequently to revenue raising considerations.

[14] The Directive is the result of a series of attempts to establish a more stringent energy taxation system in Europe. In 1997 the European Commission presented a proposal for a framework for energy products (including coal and gas) and electricity. After a long process of discussion and modification of this proposal the EU Council finally adopted Directive 2003/96/EC.

[15] In the Directive the key term Level of taxation refers to the total charge levied on specific indirect taxes (except VAT) calculated directly or indirectly on the quantity of energy products and electricity at the time of release for consumption. For example in Sweden the total excise duty on mineral oil products is composed of two elements: the energy tax and the CO_2 tax.

[16] The effect of this framework has been modest because most countries already had high rates that the minimum rates do not require. However, it implied increases in energy taxation in the new Member States as in most of them only a transport fuel was taxed and at a low rate. On this see Kouvaritakis (2005).

	Excise Rates	Rate (business use)	Rate (non business use)
Diesel (€/1000 l.)	18	21	21
Heavy oil (€/1000 l.)	13	15	15
Kerosene (€/1000 l.)	0	0	0
LPG (€/1000 l.)	0	0	0
Natural Gas		0.15	0.3
Coal and coke		0.15	0.3
Electricity		0.5	1.0

Minimum level of taxation and other public facilities to

	Previous Minimum Excise Rates	Minimum Excise Rates from 1.1.2004	Minimum Excise Rates from 1.1.2010
Petrol (€/1000 l.)	337	421	421
Unleaded Petrol (€/1000 l.)	287	359	359
Diesel (€/1000 l.)	245	302	330
Kerosene (€/1000 l.)	245	302	330
LPG (€/1000 l.)	100	125	125
Natural Gas	100 (€/1000 kg)	2.6 (€/gigajoule)	2.6 (€/gigajoule)

Provided that they comply with the minimum levels of taxation applied by Member States, the following changes:

- whether the differentiated rates are directly linked to product quality or dependent on quantitative consumption levels (electricity and energy products used for heating purposes);
- for the following uses: local public passenger transport (including taxis), assistance services, public administration bodies and ambulances;
- between business and non business uses of the energy products and electricity referred to above.

Moreover, the Directive includes a number of general and Member specific exemptions or transitional rules. In addition, a mandatory derogation adopted on April 2004 by the EU Council of Ministers that allows Estonia, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia to apply temporary exemptions or reductions in levels of taxation. Directive 2004/75/EC allows the energy Directive allowing Cyprus to apply temporary exemptions or reductions in levels of taxation.[17] These exemptions are limited in time and last no longer than 2012.

The following are exempt from taxation:

- energy products and electricity used to produce electricity and electricity used to maintain the ability to produce electricity. However, Member States may subject these products to taxation;
- energy products supplied for use as fuel for the purpose of air navigation other than in private pleasure flying;
- energy products supplied for use as fuel for the purposes of navigation within Community waters, including fishing, other than in private pleasure craft, and electricity produced on board a craft.

In addition, Member States may apply total or partial exemptions or reductions in the level of taxation to, inter alia:

- energy products used for fiscal control in the domain of pilot projects or technological development of more environmentally friendly production or use from renewable sources;
- biofuels as defined in the European Directive 2003/30/EC);
- forms of energy which are free of solar, wind, hydrothermal, geothermal origin or from biomass or waste;
- energy products and electricity used for the carriage of goods and passengers by railway, tram, trolley bus or bus;
- energy products supplied for use as fuel for navigation on inland waterways (any such dredging, fishing) other than in private pleasure craft, and electricity produced on board a craft;
- natural gas and LPG used as a propellant.

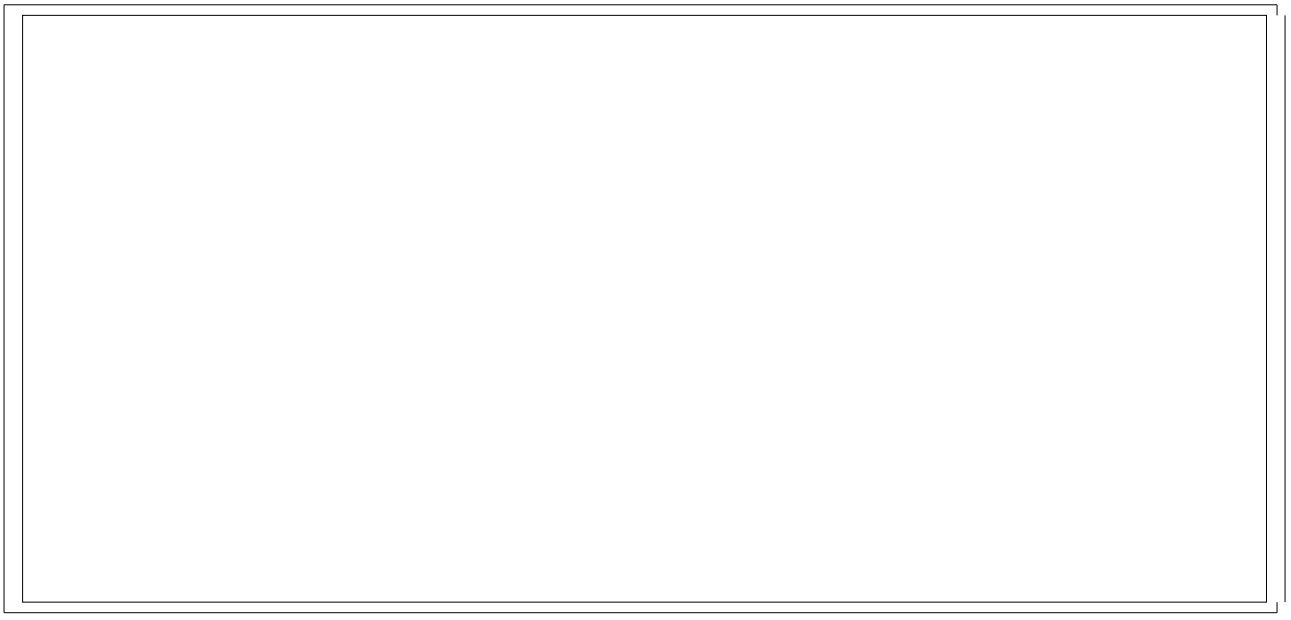
Reduced rates and exemptions from taxation applicable to Member States are set out in Annex IV of the Act.

[17] Directive 2004/74/EC in the energy Directive allowing the Czech Republic, Estonia, Latvia, Lithuania, Hungary, Malta, Poland, Slovenia and Slovakia to apply temporary exemptions or reductions in levels of taxation. Directive 2004/75/EC allows the energy Directive allowing Cyprus to apply temporary exemptions or reductions in levels of taxation.

The Directive takes account of the competitiveness of business by providing measures to alleviate the tax burden on energy intensive businesses and/or businesses that undertake to implement environmental protection objectives or to improve energy efficiency.
It also provides that Member States may refund, fully or in part, taxes paid by products that have undergone the relevant authorized energy use. This refund may be as much as 100% in the case of energy intensive businesses and up to 50% for other businesses[18]

The presence of minimum rates and extensive system of exemptions has resulted in much variation in tax rates on main energy products among member states, as illustrated in Graph 6 and 7 for the example of petrol and gas oil. Graph 6 shows the high variation in nominal rates of unleaded petrol by country as of 1 July 2010[19], within the European Union countries, highest excise duty rates fixed by the Netherlands at 713.9 Euros, also, most notably the minimum rate (fixed at 359 Euros per 1000 litres) is inversely by far and Romania are above but what minimum excise duty rate, with 350.4 Euros and 348.4 Euros respectively, resulting from a transitional period established by the Accession Treaties.[20] One general revenue trend in the nominal excise duty rates followed by the EU 27 countries between 2005 and 2010 has been specifically, more experienced a remarkable increase in its national duty rate in the last five years that has increased by over 110%, as an instrument to reduce the high budget imbalances. Finally, Sweden and the UK are the only countries in the EU 27 that show mixed evidence because their governments increased excise duties nationally rather but the tax rates followed an opposite trend. If we consider the value of the excise duty rates as calculated with 2002-2009 exchange rates (National currency/Euro)[21].

Graph 6. UNLEADED PETROL excise duty rates in the EU Member States (as at 1 July 2010).



Note: Minimum excise duty 359 Euros per 1000 litres. Values in Euro as at 1/10/2009.

Source: European Commission Taxation and Customs Union (2010)

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18 http://europa.eu/legislation_summaries/internal_market/single_market_for_goods/motor_vehicles/actions_industry_policy/l27019_en.htm.

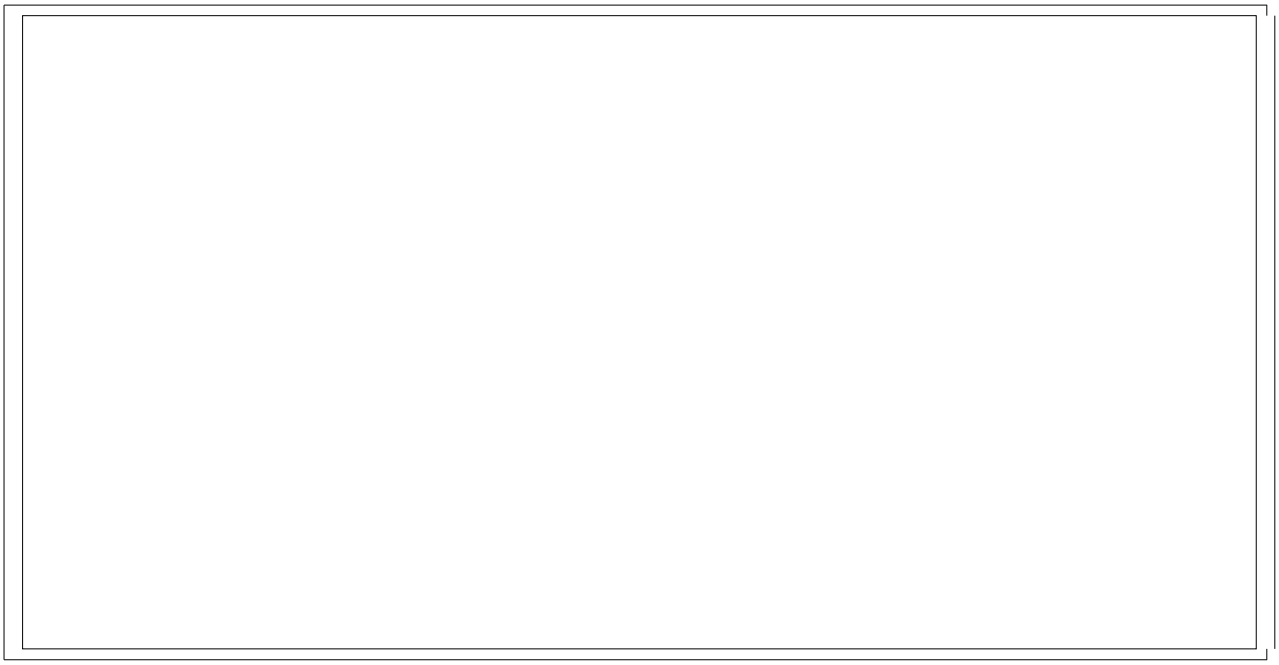
19 Data Source: European Commission (2010) Excise duty tables Part II Energy products and Electricity

20 Some countries used different rates depending on the sulphur content of petrol.

21 Considering the excise duty rates in National Currency Units, Sweden increased its national duty rate (2005-2010) from 3.90 SEK to 3.81 0 SEK. Similarly, the UK increased its national main rate (2005-2010) from 50.19 GBP to 57.1.9 GBP on normal unleaded petrol.

With the same minimum excise duty set at 21 Euro per 1000 litres gas oil heating has a lot what also all European countries is apply similar arrangements for business and non-business use. As shown in Graph 7, the EU Member States that have a relatively high tax rate on gas oil for business heating use are: the Czech Republic, Denmark, Greece, Ireland, Italy, Hungary, Malta, the Netherlands, Portugal, Romania, Slovakia. These countries have set fixed their excise duty rates above 330 Euro per 1000 litres.

Graph 7: GASOIL heating business use excise duty rates in the EU Member States (as at 1 July 2010).



Note: Minimum excise duty 21 EUR per 1000 litres. Values in EUR at 1/10/2010.

Source: European Commission Taxation and Customs Union (2010)

The gas oil trend (2002-2010) for both business heating use and non-business use shows that the majority of EU 27 countries increased their nominal excise duty rates so, more than many other environmental market-based instruments, the case of the Netherlands (which almost quadrupled its rate) and Greece (+68% in gas oil for non-business use is heating use).

Although excise energy taxes always connect to the Pigouvian framework, countries have set or updated tax rates without proper reference to the marginal damage[22], focusing more on revenue raising, public acceptance and inflation. According to the OECD's computation[23], the average change in the tax rate on petrol over the last decade (2000-2010) was 3.1%, and for Austria, France, Spain, Italy, Hungary and the Slovak Republic a decrease of more than 10% was recorded. On the contrary, Japan, Portugal and Greece showed an increase of more than 100%, but this is more to be connected to the after-math of the financial stimulation rather than investments in external costs.

Moreover, almost all countries use exemptions, tax rebates for some sectors or users, under the Directive's framework. Those extensive exemptions and deductions refer to agricultural and mineral products, but generally speaking, through the lens of cross-subsidization between users and sectors, can be identified for all energy products.

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22 For recent analyses of the optimal tax rate on petrol, see Ian Parry (2009) and Parry and Small (2005).

23 See OECD (2010).

As shown by the previous examples, very different types of energy product tax rates set by Member Countries reflect tax rates vary with the energy use, product specific activity, special concessions and, in some countries, regional factors. Moreover, in some cases tax rates include CO2 taxes in order to give a general idea of the tax burden on energy. Table 2 shows implicit tax rates computed as the ratio of energy product revenues to final inland consumption.

Table 2
Implicit tax rates on energy products (*)

	Mineral Oils	Natural Gas	Coal and Coke	Electricity	Total
BE	0.16	0.003	0.007	0.006	0.08
BG	0.21		0.001	0.005	0.08
CZ	0.31	0.005	0.003	0.008	0.11
DK	0.32	0.125	0.049	0.406	0.23
DE	0.31	0.027	0.000	0.139	0.15
EE	0.27	0.008	0.000	0.034	0.12
IE	0.26				0.13
EL	0.17		0.003		0.11
ES	0.18			0.056	0.09
FR	0.27	0.006	0.001		0.13
IT	0.29	0.035	0.003	0.051	0.13
CY	0.10				0.08
LV	0.27		0.006	0.002	0.11
LT	0.16		0.006		0.07
LU	0.31	0.004		0.005	0.19
HU	0.28	0.008		0.008	0.09
MT	0.09			0.009	0.07
NL	0.21	0.076	0.002	0.152	0.13
AT(**)	0.29	0.044			0.15
PL	0.26			0.073	0.08
PT	0.20	0.000			0.10
RO	0.18	0.003	0.001	0.005	0.06
SI	0.28	0.004	0.000	0.006	0.16
SK	0.26	0.001	0.000	0.002	0.07
FI	0.24	0.022	0.016	0.060	0.12
SE	0.33	0.087	0.012	0.183	0.24
UK	0.34	0.007			0.11

(*) Tax Revenue in million euros / thousand tonnes oil equivalent (TOE) as final inland consumption.
(**) Gas figure includes coal and electricity

Source: computation on European Commission and Eurostat data

Although these implicit tax rates are very rough approximations of the energy related tax policy of Member States, considerable variation among countries' products can be appreciated. This variation gives a description of the tax design of Member countries (i.e. it is linked to nominal tax rates) but at the same time it gives some hints

[24] Revenue classification categories, provided by European Commission, can cause some heterogeneity among member states. It is not clear for, instance, whether revenues from allowed fees or emissions permits are taken into account. As regards the denominator, on the other hand, the gross final consumption aggregate approximates tax bases for different products differently.

on preferential treatment for some energy products. The largest threshold between nominal and implicit tax rate ranking is the large use of hidden tax rebates, more generally, tax exemptions.

Lastly, it is worth stressing that given European countries' specific concern for the CO_2 content of energy products: Scandinavian countries' product-specific action in the Nineties on the basis of a Commission proposal for a common taxation of CO_2, which was never approved by the Council. Finland was the first country to adopt a carbon tax in 1990 (table 3). This tax applies to gasoil, diesel, heating oil, fuel oil, aviation petroleum, kerosene and natural gas. Although it was initially based on the carbon content, it was later changed to a 60% carbon component and a 40% energy component but returned to a pure carbon item in 1997, having increased recently to 20 per metric ton of CO_2.

Table 3
Carbon taxation in the EU

Country	Starting year	Rate (per CO_2 tonne)	Revenue in 2008 (million €-s)	Revenue use (other than general purposes)
Denmark	1992	12	681	Environmental protection programs, reduction on personal income tax and on social security contributions
Ireland	2009	15	250 (estimation for year 2010)	Environment protection programs and grants for low income households
Slovenia	2007	16	30	None
Finland	1990	20-41	500	Environmental protection programs
Sweden (*)	1991	108	2647	Environment protection programs, reduction on personal income tax

(*) Standard rate mainly for households and services, reduced rates apply to industry.

Ireland, at the other extreme, introduced recently a carbon tax in 2008, after a long debate as part of a generic package of fiscal consolidation. This carbon tax applies to petrol and diesel (from late 2010), to kerosene, marked gasoil, liquid petroleum gas (LPG), fuel oil and natural gas (from May 2010). Participants to the EU emission trading scheme (ETS) are exempt from the tax. As regards tax rates, our countries' out of five have a tax rate that ranges between 12 and 20 Euros, so far from the carbon price that has recently emerged from the ETS. A very different approach was adopted by Sweden, which has since 1991 levied a tax rate on CO_2 to a level of 108 Euros, obtaining revenues of over 2 billion. However, energy-intensive industry is provided with many rebates. ETS firms are completely exempt from the CO_2 tax, while firms outside the ETS will be subject to it up to 60% of the standard rate only from 2015.

Box 2. Towards revisions of the Energy Tax Directive?

Although hopes were aroused by Deloitte Shitpeapeth, the European Union has so far shown to be unable to set up European Carbon Tax and its broad proposals, through public meetings[25], the European Commission tried once again in 2008 to put carbon taxation at the top of the agenda as an additional instrument for fighting climate change. The draft proposal aims at a different approach which, changing from simply avoiding the negative effects of overlapping instruments (such as energy taxes and the EU emissions Trading Scheme (ETS)) to the introduction of an additional uniform CO_2 related taxation top of taxes already existing under the European Energy Directive (which implements EU ETS). As a new common tax appears politically unfeasible, the Commission's

[25] EUROPEAN COMMISSION (2009). For a comment on the proposals see LAURENT, LE CACHEX (2009).

recently announced[26] a proposal to amend the common energy tax and policy in order to tax energy products with reference to climate change emissions, in addition to their energy content. At the same time the revision would exempt sectors covered by the Emissions Trading Scheme and abolish tax concessions or exemptions for some sectors.

Compared to the existing Directive, would provide important environmental incentives:

- minimum levels of taxation (€20 per tonne of CO_2 emitted) and differentiated rates of fuels linked to the intensity of their emissions to be effective from 2013.
- a charge to tax base from the current unit of 1000 litres to the energy unit of Gigajoule (heat energy content) content of each fuel.
- the exclusions from the scope of the Energy Taxation Directive of CO_2 related taxation of products that are bio mass or are made from bio mass[27].
- tax reductions concerning CO_2 taxation for sectors exposed to significant risks of carbon leakage.
- the alignment of tax rates at regular intervals to take into account the evolution of their real values.

2.2 Public Revenues from the Emission Trading Scheme

2.2.1 Revenue from auctioning

The European Emissions Trading Scheme, introduced in 2003, is a cap and trade system to limit greenhouse gas emissions from the heavy industry installations in the EU. After a period of learning by doing, the market entered into force in 2008 together with the Kyoto protocol. Member States set a cap on total emissions and the distribution of allowances to the firms in the scheme (mainly for free). These allowances can be traded with others but it is important that companies at the end of the year firms are required to have enough allowances to cover their emissions, since carbon price acts as the market mechanism as a device to match demand with the fixed supply of allowances. After the end of the Kyoto protocol (December 2012), the ETS scheme will run into a third phase in which the range of economic activities[28] will be expanded and the grandfathering allocation will be replaced by auctioning. Although from economic efficiency ground there is no difference between allocation by auction or by grandfathering (provided that no market imperfections exist), two options have different impacts on the budget: grandfathering implies permits to emit are distributed for free, whereas auctioning implies revenues for governments. This is the reason why a switch towards auctioning has been decided for the third phase.

Although grandfathering is the general principle in phase 2, Member States are permitted to auction up to 10% of their allowances. However, only a few Member States (Austria, Germany, the Netherlands and the UK) have made use of this possibility so far, although Germany and the UK have auctioned significant amounts.

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[26] See European Commission (2011). http://www.eurunion.org/pdf/Energy%20Taxation%20Interservice%20proposal.pdf

[27] Note that economic sectors are involved in the scheme. Only energy activities (production and processing of ferrous metals, mineral industry and pulp and paper industries) are included at the moment.

[28] Other important features of the ETS revision are the inclusion of additional greenhouse gases and the centralized and harmonized allocation methodologies. See Directive 2009/29/EC.

Table 4
Estimated revenue from auctioning

Country	Annual quantity to be auctioned in phase III. Levels as % of national allotment
Austria	400,000 103%
Germany	40 million 9%
Netherlands	3.2 million 3.7%
UK	17 million 7%

Deutsche Bank (2010)

The UK will auction 7 per cent of its allowances using the second phase approximately 17 million annual allowances, making a total of 85 million between 2008 and 2012. The public revenues resulting from the auction primarily depend on price since its first Phase II auction (November 2008), 1 million allowances were distributed at a clearing price of £16.15 (€13.60) since then 54 million.[30]

2.2.2 Taxation of Emission Trading Permits

The general aim of the European Emission Trading Scheme is to reduce and develop the abatement of greenhouse gases. Even a tax system to be neutral, it claims must have no effect on the location of abatement and no arbitrage opportunities should arise. Therefore, is part of the taxation treatment across European countries should affect the efficiency of the trading scheme (making abatement efforts more costly than otherwise) and that the same time could open opportunities for tax planning and arbitrage, even if evenly across many Member States. Evidence of this tax planning opportunity is the wide spread VAT fraud (known as the Carousel Fraud), ended by overlay several Member States, which resulted in suspension of the rich Art VI Regime. Emissions in The main reasons existence and the trading of emissions allowances given rise to direct and indirect tax issues. Emissions allowances create by regulatory authorities in the result of an auction process should allowances given the form of the right to emit one ton of carbon dioxide must be returned to the national authority proportionate to effective verified emissions. Assuming competitive, the price can vary from zero (if there is free allocation) to market determined price, but their value and change during the reference period of carbon market conditions change. Moreover, emissions allowances can then be traded between market participants (as some firms will need to buy additional permits, while we have mentioned some firms will be able to sell). A) preliminary problem that can influence the reaction in direct actions the classification of the allowances: is a carbon permit to be considered a commodity, a financial service, an intangible asset or an item that can be put in the inventory. Classification as an intangible or tangible asset may also influence the result.

30 Total revenues were estimated more than 1 billion.

As regards direct extant, the original transfer of allowances as a general is not subject to VAT. In the case of free allocation no VAT is due because the price is zero or, here in fact, no auction bank exists at the allocation is not under the VAT regime because it is performed by a Public Body. However, recent enforcement by the European Court of Justice has ruled that state actions or public bodies must be subject to VAT in respect of any transactions activities they are engaged in unless these can be demonstrated that these actions or activities do not create, or are not likely to create, significant distortion of competition[31]. This will probably imply that VAT will be charged on future CO_2 permit auctions.

Subsequent transfer allowances between taxable persons can be considered supply of services and are taxable in the place where the recipient is established. However, during the summer of 2009 a number of cases of suspected fraud were detected and this urged the European Commission[32] and Member States to take measures against the application of a reverse charge system[33] (Ireland and the Netherlands), the removal of allowances from the VAT regime (France) and the application of a zero rate to the steam auction (UK). Poland decided to classify allowances as financial services, which removes the trading from the VAT regime.

Selling and buying emission allowances generates revenues and costs in firms' balance sheets and thus affects corporate taxation. As previously discussed, the allocation method does not make a difference in tax treatment implications in the case of classification as commodities, they allow companies to consider as costs when purchased and, as taxable income when sold[34]. If carbon permits are treated as intangible assets, they enter into balance sheet activities, the cost is shared by the general depreciation mechanism, i.e. a fraction of the total cost to be computed as deductible each accounting period. Last, if allowances are considered financial assets, the tax debate is based on the financial motivation of the investment (whether it is a pure financial investment or an investment to meet an obligation, i.e. investments performed by a financial firm etc.). In order to avoid arbitrage opportunities and fraud, harmonization of tax principles regarding carbon allowances is urgently needed. This coordination with other key tax related policies in the EU will be complicated people, a key step for the progress of the carbon market.

3. Energy-related subsidies

3.1 Defining the issue

In spite of its importance in the public debate and political agenda, there is not yet a common and shared definition of what a subsidy, regarding fossil fuels, is considered. Nonetheless, the common point of view used

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[31] See for instance ECJ Case C-288/07, 16th September 2008 and COMMISSION vs IRELAND, Case C-544/07.

[32] See the Directive 2010/23/EU of 16 March 2010, amending the "VAT Directive" in order to introduce a mandatory and temporary application of the reverse charge mechanism in relation to supplies of certain services susceptible to fraud.

[33] The reverse charge mechanism is a system where the obligation to pay VAT is shifted from the supplier to the buyer of a product/service. This system may, already in place across borders, lead in cases of credit sales extended to domestic transactions.

[34] For an analysis of implications on corporate taxation in EU, see EGTAXUD (2010).

in the various steps[35] to define the issue that should be part of the definitions should include not only the direct financial support that the government makes to producers, consumers, but should also be extended to cover both those actions that directly target the energy sector[36] and those measures which support it without explicitly considering it[37]. Furthermore, studies have asserted that the energy sector in particular, due to the specific characteristics (e.g. limitation of civil liability from nuclear accidents and lack of measures that impose external costs to producers) should be taken into account. The various types of government intervention possible are summarized in the following table, which also shows how subsidies usually work:

Table 5
Types of energy subsidies and their effects on production costs and consumer prices

Government intervention	Examples	How the subsidy usually works		
		Lower costs of production	Raises price to producer	Lower price to consumer
Direct financial transfer	Grants to producer	x		
	Grants to consumers			x
	Low interest or preferential loans	x		
Preferential tax treatment	Rebates, exemptions on royalties, lease taxes, production credits and tariffs	x		
	Tax credit	x		x
	Accelerated depreciation allowances on equipment	x		
Trade restrictions	Quotas, technical restrictions and trade embargoes		x	
Energy related services provided directly by government at less than full cost	Direct investment in energy infrastructure	x		
	Public R&D	x		
	Liability insurance, facility decommissioning	x		
Regulation of the energy sector	Demand guarantees and mandated deployment	x	x	
	Price controls		x	x
	Market access restrictions		x	

Source: UNEP (2008), Reforming Energy Subsidies

[35] See for instance IEA (International Energy Agency) 2006, Carrots and Sticks Taxing and Subsidising Energy, Note on Energy Subsidies and Taxes 1st January 2006, EIA (Energy Information Administration) 1992, Federal energy subsidies direct and indirect interventions in energy markets, EIA Service Report, US Department of Energy, Washington, DC; TWO Agreement on Subsidies and Countervailing Measures, art. 1

[36] For example, public R&D on energy technologies or public intervention in building energy specific facilities like dams and pipelines.

[37] For example, tax exemptions from market regulation.

[38] EEA (2004) and EIA (2010)

On the basis of this classification, subsidies can be classified as:

- on-budget subsidies, which include measures which appear as outlays in the general government balance sheet, like direct financial transfers as appropriations for energy related services undertaken by the government;
- off-budget subsidies, which include those measures featuring in the balance sheet, like the provision of tax expenditures or so-called 'in origin' from market regulation.

Because of the difficulty in quantifying the value of some of the items above and the lack of comparable data for the EU 27 countries, on-budget subsidies can be estimated by analysing national accounts. S. Data on tax expenditures are an example of off-budget subsidies which allow[39]

3.1.1 On-budget[40]

For on-budget measures, the estimation of subsidies is based on Eurostat's Government expenditure by function, where a distinction between Direct financial transfers and Energy related services provided directly is made. This breakdown from the budget expenditure for all the activities in the energy sector except for R&D, which is shown in a separate row.

Table 6 shows that in 2008, the total appropriations for the energy section in EU 27 amounted to about 13.5 billion Euros, one quarter of which was earmarked for R&D activities. Some features that account in favour of direct financial transfers are the ability to provide energy related services supporting the energy sector. The scale of the country mix and its impact, since linked more to country specific energy source endowments such as the absence of energy sources and the level of support in large economies like Italy. Data for R&D appropriations mostly (except for the UK) have a high correlation with the size of the economy, specifically for the larger countries, which actually account for about 90% of the EU 27 expenditure on energy sector R&D.

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[39] The lack of official and comprehensive data on public subsidies to the energy sector is underlined by all the international institutions dealing with the environmental and energy issues. The most recent data for European Member States energy related subsidies are those estimated for 2001 (EEA (2004). See also EEA et al (2010) and UNEP (2008) for a global analysis of this issue.

[40] From General government expenditure by function, the entries 'Subsidies' (D.3) and 'Capital Transfers' (D.9) have been used to estimate the financial transfers by general government whilst the entries 'Intermediate Consumption' (P.2), 'Gross Capital Formation' (P.5) and 'Compensation of Employees' (D.1) have been utilized to estimate appropriations by general government for undertaking energy related services. As concerns the entries above, only the (sector level) entry 'Fuel and energy' (04.3) of Economic Affairs (04) has been taken into account. R&D expenditure comes from the dataset Government Budget Appropriations or Outlays on R&D (gba nabs07), entry 'Energy' (05) of the NABS (Nomenclature for the Analysis and Comparison of Scientific Programmes Budget).

Table 6

Energy related expenditure 2008 (data in millions of euro and as % of GDP)

Kind of General Government intervention (excluding R&D sector)		Direct financial transfers	Energy related services provided directly	Subtotal by Country	General Government energy related R&D appropriations	Total in million Euro	Total as % of GDP
Country (2008)	BE	451.	95.	547.	36.	583.	0.
	BG	7.	9.	17.	10.	27.	0.
	CZ	72.	96.	168.	23.	192.	0.
	DK	4.	18.	22.	77.	100.	0.
	DE	2850.	270.	3120.	727.	3847.	0.
	EE	57.	5.	62.	3.	65.	0.
	IE	0.	319.	319.	28.	347.	0.
	EL	0.	0.	0.	13.	13.	0.
	ES	828.	208.	1036.	456.	1492.	0.
	FR	952.	324.	1276.	855.	2131.	0.
	IT	131.	142.	273.	589.	862.	0.
	CY	0.	0.	0.	0.	0.	0.
	LV	6.	42.	48.	3.	52.	0.
	LT	9.	44.	54.	0.	54.	0.
	LU	21.	46.	67.	5.	73.	0.
	HU	0.	7.	7.	9.	17.	0.
	MT	57.	0.	57.	0.	57.	1.
	NL	296.	276.	572.	112.	685.	0.
	AT	42.	1.	43.	18.	61.	0.
	PL	248.	76.	325.	25.	350.	0.
	PT	466.	36.	502.	20.	523.	0.
	RO	125.	75.	200.	41.	241.	0.
	SI	4.	12.	16.	2.	18.	0.
	SK	113.	18.	131.	3.	135.	0.
	FI	36.	7.	43.	159.	202.	0.
	SE	75.	199.	275.	94.	369.	0.
	UK	648.	373.	1021.	87.	1108.	0.
	EU27	7504.	2706.	1021.	3405.	1361.	0.

Source: Author's calculation on Eurostat data

The share of overall budget energy related expenditure of GDP is shown in the graph below; it is evident that the weight is not sizeable in every country around 0.2 percent of GDP and around half percentage point of Total Expenditure.

Box 3

Public R&D expenditure in Germany and the Czech Republic

A leading energy related R&D expenditure is taken by Germany. The R&D expenditure in this area amounts to 500 million Euros, which the greatest share is devoted to Nuclear (Fusion and Fission) and Renewable energy sources.

Among the renewables, the support needs its R&D for solar thermal and photovoltaic energy, while a share reduction in R&D for water, wind and wave energy can be noticed, simultaneously with a overall increase in the earmarked flow R&D in renewable sources.

German (million euro)		Year				
NABS 92 Classification		2006	2005	2004	2003	2002
General research into production, distribution and rational utilization of energy		29.	25.	23.	27.	33.
Fossil fuels and their derivatives		23.	19.	14.	16.	25.
Nuclear fission		116.	117.	122.	126.	144.
Radioactive waste management including decommissioning with regard to fuel energy		5.1	7.	6.	11.	15.
Nuclear fusion		127.	134.	134.	120.	153.
Renewable energy sources		135.	102.	99.	147.	143.
	Solar thermal and photovoltaic energy	116.	78.	78.	103.	118.
	Geothermal energy	6.	3.	3.	12.	2.
	Water, wind and wave energy	2.	4.	3.	22.	18.
	Research into biomass conversion (particularly in the areas of pyrolysis, gasification, extraction and enzyme processing), research into the processing of waste from industry, trade, agriculture and the domestic sector with a view to energy production	11.	16.	13.	8.	5.

Rational utilization of energy		76.7	82.1	74.5	64.1	34.9
Other research, production, distribution and rational utilization of energy		0.0	0.1	0.1	0.7	5.6
Total		514	7490	6473	9513	2 556.3

Source: Eurostat

Czech Republic: Even though the weight of appropriations for renewable energy sources increased (from about 2 to 16%), the level of support was still high in 2006, like in Germany, but the composition is completely different as the largest parts represented by research in biomass conversion, in particular, is also given to geothermal energy research, which, was the major recipient of the increased overall level of support in 2006, more than compensating for the losses deriving from the phase out of expenditure on research in water, wind and wave energy.

Czech Republic (in million euro)		Year				
NABS 2C classification		2006	2005	2004	2003	2002
General research, production, distribution and rational utilization of energy		1.3	1.4	0.4	0.0	0.0
Fossil fuels and their derivatives		0.2	0.0	0.1	0.2	0.2
Nuclear fission		4.3	3.5	2.6	1.7	1.6
Radioactive waste management including decommissioning with regard to fuel energy		1.3	1.5	1.2	1.1	1.0
Nuclear fusion		2.4	2.2	1.6	0.1	0.3
Renewable energy sources		2.6	1.6	1.9	1.7	1.4
	Solar thermal and photovoltaic energy	0.5	0.7	0.7	0.6	:
	Geothermal energy	0.8	0.0	0.0	0.0	:
	Water, wind and wave energy	0.0	0.1	0.2	0.2	:
	Research in biomass conversion (particularly in the areas of pyrolysis, gasification, extraction, enzyme processing); research in the processing of waste from industry, agriculture and the domestic sector with a view to energy production	1.3	0.9	0.9	0.9	:
Rational utilization of energy		3.3	2.6	1.3	1.3	1.4
Other research, production, distribution and rational utilization of energy		0.0	0.4	0.4	0.8	1.4
Total		15.5	13.2	9.4	7.4	7.3
Production, distribution and rational utilization of energy		15.6	13.3	9.4	7.4	7.3

Data in million of Euro

Source: Eurostat

The data sweet chosle ens to allow stoidentify the specific energy sector the support is addressto (id e.g. coal, oil, nuclear, renewable). In order to estimate these quotas is necessary on findings from the study ie The European Environment Agency technical report to Energy Subsidies: The European Union a brief overview dealwith the same issue. 2004 and estimated annual budgetary off budgets subsidies the energy sector in EU 15 for each energy source, starting from EEA estimated quotas, total subsidies allocated to energy sources shown in Table 7. This evaluation suggests the level of public support for solid fuels (mainly coal) is an average value of 9.5 billion Euros, while the oil and gas sector would not reach the threshold of 0.3 billion; the outlay for the nuclear sector would amount on average to 1.5 billion and last, those addressed towards renewable sources could be a little less than 1 billion (87 million Euros). Given the remark exposed above, renewable energy industries and the government support they receive is more country specific and in the last decade these figures should likely become less and less every year, starting point.

Table 7: Simulation of annual budgetary support for different kinds of fuel (Millions of Euros)

		Kind of Fuel[1]				
		Solid fuels	Oil and gas	Nuclear	Renewables	Total annual budgetary amount
	%	78.0	2.4	12.2	7.3	
Year	2008	1062	332	1660	996	1361
	2007	925	289	1446	867	1185
	2006	852	266	1331	798	1091
	2005	898	280	1404	842	1151
	Average	934	292	1460	876	

[1] Electricity subsidies are estimated values on the basis of generation inputs

Source: EEA

[41] EEA estimations refer to 2001. Even though the two aggregates are broadly defined in the same way, due to data, the panel of countries and the methodology are quite different.

3.1.2 Off-budget

Among off-budget subsidies, the reduction of VAT rates on energy products is considered important. Several European countries have reduced rates of VAT on the consumption of energy products. The difference between the standard rate and the special applied rates on specific products (mainly household, agriculture) gives the magnitude of the implicit subsidy. Own thinking table below by country and type. This kind of tax expenditures is widely employed in Ireland, Portugal, Hungary and the UK, and is limited to one product elsewhere (Spain, Belgium and Italy).

Table 8
Reduced VAT rates on energy products in the EU

Country	Energy product	Use	User	Special VAT Rate	Standard VAT rate (2011)
Belgium	Coal and Coke	All		12.0	21.0
Greece	Natural Gas	All		11.0	23.0
	Electricity	All		11.0	
Spain	Petrol	All		16.0	18.0
Ireland	Gas Oil	All but propellant		13.5	21.0
		Process plant	Motor fuel for agricultural purposes	13.5	
			Agriculture, horticulture, fishculture, forestry	13.5	
			Railways	13.5	
	Kerosene	All but propellant		13.5	
	Heavy fuel oil	All		13.5	
	LPG	All but propellant		13.5	
	Natural Gas	All but propellant		13.5	
	Coal and Coke	All		13.5	
	Electricity	All		13.5	
Italy	Natural Gas	Heating	Non business & up to 480 m^3	10.0	20.0
Cyprus	LPG	All		5.00	15.0
Luxembourg	Gas Oil	Heating	All	12.0	15.0
	LPG	All		6.00	
	Natural Gas	All		6.00	
	Coal and Coke	All		12.0	
	Electricity	All		6.00	
Portugal	Gas Oil	All but propellant		13.0	23.0
		Process plant	Motor fuel for agricultural purpose	13.0	
			Agriculture, horticulture, fishculture, forestry	13.0	
			Railways	13.0	
	Kerosene	Heating	All	13.0	
	Heavy fuel oil	All		13.0	
	Natural Gas	All		6.00	
	Electricity	All		6.00	
United Kingdom	Gas Oil	Heating	Domestic sales less than 2300 litre deliveries	5.00	20.0
	Kerosene	Heating	Domestic sales less than 2300 litre deliveries	5.00	
	Heavy fuel oil	Heating	Domestic sales less than 2300 litre deliveries	5.00	
	LPG	Heating	Domestic sales less than 2300 litre deliveries	5.00	
	Natural Gas	Heating	Domestic sales less than 2300 litre deliveries	5.00	
	Coal and Coke	Heating	Non business	5.00	
	Electricity	All	Non business	5.00	

For an estimation of the budget impact of this kind of tax expenditure, price rises, tax rate abatement consumption by users and uses should be taken in account.

Table 9 summarizes the results of the study on VAT tax expenditure by IEEP for 2004, which has also been the fuels considered.

Table 9 Implicit subsidies to household consumption by reduced VAT rates (estimates in millions of Euro 2004)

Country \ Consumption	Solid fuel	Fuel oil	Natural gas	Electricity	Total by Country
Belgium	6.				6.
Estonia	0.				0.
Greece			4.	239	243
Hungary	1.				1.
Ireland	11.	30.	52.	152	247
Italy	0.		114	1532	1647
Luxembourg		2.	12.	25	41
Malta				10	10
Portugal		26.	39.	556	622
United Kingdom	45.	54.	1907	2491	4499
EU 25 total	65.	114	2130	5008	

Source: EEA (2007)

Among subsidies to household fuels, all at the large expense of its grant to the electricity and gas sector (almost 98% of the total). Moreover, it is worth stressing that these figures are per annum bigger than the one budget subsidies.

BOX 4 Biofuel subsidies

Following the long experience of biofuel use and promotion in Member States, the EU Commission has made biofuels policy the Eighth[42], where the role of biofuels in reducing Member States dependence on oil imports was highlighted. Since the reduction of energy dependence has been linked to the promotion of European Agriculture and the biofuels sector was also supported through the Common Agricultural Policy.

The first but unlucky example of the use of tax instruments in this area was the proposal known as the Scrivener Directive (1992), where the exemption of liquid biofuels from fuel excise taxes was recommended, though the Scrivener proposal did not become a Directive, influenced by Member States national policies: in the early Nineties, France, Austria, Germany, Italy and almost all other MSs introduced some form of tax exemption or reduction[43]. After the EU signed the Kyoto protocol, a series of White Paper called for an increase in biofuel importance and a Directive of 2003 set reference values for the proportions of biofuels in petrol and diesel[44], while Directive 2009/28 increased the target to 10%. Thus, this quota system requires the use of biofuels in a given fraction of the road transport fuel mix and the possible increase is shifted to consumers, as shown by the table below, even Member States employ quota obligations, tax credits or tax reductions[45].

Overview of main biofuel support instruments in the EU 27

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[42] Directive 85/536/EEC of 5 December 1985 on crude oil savings

[43] Although almost all Member countries have employed tax rebates for biofuels, there is a huge variation in the intensity of this kind of subsidy, in the definition of eligibility. Moreover, France and Italy have introduced a ceiling to the amount of biofuels that can qualify for tax exemption in order to limit the budget expenditure.

[44] The reference value was set at 5.75 per cent market share (in energy content) of all petrol and diesels for transport purposes by 31 December 2010. Directive EC 2003/30

[45] Almost all Member countries have employed tax rebates for biofuels but there is a huge variation in these subsidies.

Source: Ecofys (2011)

For 2006, GSE estimated biofuels support at more than 10 billion dollars in the main developed countries, which more than 4 billion are estimated for the European Union.

Provisional data support estimate (PSE) per ethanol and biodiesel in selected OECD countries in 2006

The importance of subsidies and tax exemptions for biofuel development can be highlighted by the anti-dumping duty that the EU has imposed on biofuel imports from the USA[46].

It is very important to consider hidden subsidies that take form of tariffs mainly consumer tariffs). In this case, the level of tariffs does not reflect the actual cost of energy because it includes duties imposed upon consumers mainly by way of financing green policies. This is not very different from a tax, but none the less is

[46] See COMMISSION REGULATION (EC) No 1922/2009 and 599/2009.

m o n e d y o e n s o f e a r e u i n t h e p u b l i b u d e t g . T h e r e f d r e e s , p i t h e i r i m p o r t a f r o m a n e c o n o m i c o f v i e w
a n d o a n y a l y s o f t h s r e e d i s t r i b u n t a c v t e e d i n t a r i f a r s e o i t n c l u d n e t h d s s t u y d

4. Is there any room for environmentally sustainable form?

4.1 A snapshot of the budgetary fragility in the EU-27

T h r e e e c e f i n r t a n c i a l s c i a u s a s e r i o e u c s o n o m i c o n t u r n w , h i c i s s t i l h p l a y . T h s i s i t u a t i h e i g h e n e d b y
d o u b a t s o u t h e s o l v e n o f t h y e G r e a k n d r i s G o v e r n m t s a n d t h e a b i l i t y r e p a t h e i r o u t s n d i n g s o v e r e i g n
d e b t p u t p r e s s u r n e o n c h a r k e t s a p u d l b c f i n a c t e h s r o u g h t h u e E u r o p e U a n i n . T h r e s u l t i g n e r a l
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a n d S w e d a r e) u n d e t h e E D P (E x c e s D e f i c P i r o t c e d u r f t h) E u r e a p n C o m m i s s A s s h . o w i n t h e f i s t
c o l u m n T a b l e 1 . 0 t , h e b u d e t g i m b a l n c e x c e e d s 3 % o f G D P i n a l m o a s l t c a s e T s h o r t e m f i s c a l f l o r (t i s e .
i m p r o v e m n t h e b u d g e b a h a e) a n d e a i n d e s e q u i r e d o f e a c h C o u n t o r y c o m p w y i h t h e 3 % t h r e s h a n d e l
s h o w i n t h e f o l l o w i c r o g u m o f s t h e t a b l e F o r a t l e a s t f i v e c o u n t r (i e s I a n d G r e e , L a t v i a L i t h a u n d n i a
p r e s u m a b l y U K) t h e f i s c a l f l o r e q u i r e d h e t s w o p e r c e n t a g p o i n t s o f G D P w i t h i n e x t t h r e y e a r s .
L o o k i a t h e l o n g u n i t , c a n b e n o e d t h a w i t h o f u s c a l s o l i d a t i o n t h e p a t h o f d e b t c o u l d l e a t o a n e x p l o s i v e
s i t u a t i o n 2 0 6 (f o r a l m o a s l t c o u n t r i e s n d) . [47] e f r o r e t h e p r i m a s r y p f u r s e q u i r e c o n s o l i d a n t s t a b i l i z e
t h e d e b t t o G D P a t i i s g e n e r a l i z a b l e v e n u n e s s p t e m a n e t k y e e d e x p e n i d u r e s n e t o f i n t e r e s t s a n
a m o u g n t e a t t h e r a 1 0 % o f G D P f o r G r e e S p a i n , t h e U K a n d I e l a n d (a s h o w n b y i n d i c a S 2 w h i c h i n c l u d e n s
a g e r e l a t e x p e n d i t u r e f o r e c a B a s) a n d t h e c u r e n t l e v e f d e b p r o j e c t i o f o t h s 2 0 6 0 d e b t o G D P r a t i a n d
t h e l o g t e r m f i s c a d n s o l i d r a t i q u i r e m t h e E u r o p e a C o m m i s s i a c o n s i d e r s t h e b u d g e t a r i y s f c o u n e s r i
o n a t h r e e w s c a (l e g h M e d i u m l o w) . A s s h o w n b y O v e r a i l s k a s s e s s m i e n t a b l e 1 . 0 , o n l y 5 c o u n t r (i e s
o f 2 7) a c h v i e e d a g o o a d s s e s s m w i t h a l o w r a g i t y r i s k .

[47] The primary deadlines to take into account interest payments on outstanding debt and structural measures that the balance has been adjusted to not be affected by the business cycle and by one-off and temporary measures.

Table 10

Long-term indicators of budgetary balance in the EU[48]

	General Government balance ratio (% of GDP)	Fiscal effort (annual General Government balance ratio)			Debt ratio (% of GDP)	Debt ratio projection under unchanged policy relative to 2009 (% of GDP)	Required structural primary balance permanent adjustment (% of GDP)	Overall risk assessment	Government Revenue (% of GDP)
	2010	Annual Average (% of GDP)	Starting year	Deadline	2010	2060	S2		2009
CZ	5.2	1	2010	2013	40.8	48.67	7.4	high	40.3
IE	33	1,9	2011	2015	97.4	84.85	10	high	34.1
EL	9.6	>2	2010	2014	140.2	88.40	11	high	36.9
ES	9.3	>1.5	2010	2013	64.4	76.66	1.,8	high	34.7
CY	5.9	>or=1.5	2011	2012	62.2	33.55	8.8	high	40.3
LV	7.7	>or=2.75	2010	2012	45.5	89.81	9.9	high	34.0
LT	8.4	>or=2.25	2010	2012	37.8	54.59	7.1	high	34.1
MT	4.2	0.75	2011	2011	70.4	43.25	7.0	high	40.5
NL	5.8	0.75	2011	2013	64.2	45.03	6.9	high	46.3
RO	7.3	1.75	2010	2012	30.8	63.38	9.1	high	32.1
SI	5.8	0.75	2010	2013	40.8	83.16	12	high	44.4
SK	8.2	1	2010	2013	42.4	56.12	7.4	high	34.0
UK	11.5	1.75	2010/2011	2014/2015	77.4	75.92	14	high	40.2
BE	4.8	0.75	2010	2012	98.0	37.24	5.3	medium	48.2
DE	3.7	>or=0.5	2011	2013	75.2	31.89	4.2	medium	44.3
FR	7.7	>1	2010	2013	83.0	43.13	5.6	medium	48.1
IT	5.0	>or=0.5	2010	2012	118.9	20.59	1.4	medium	46.6
LU	1.8				18.3	43.75	12.5	medium	41.6
HU	3.8	>or=0.25	2010	2011	78.4	26.1	0.1	medium	45.8
AT	4.3	0.75	2011	2013	70.4	33.78	4.7	medium	48.3
PL	7.9	>or=1.25	2010	2012	55.0	31.84	3.2	medium	37.4
PT	7.3	1.25	2010	2013	82.8	38.99	5.5	medium	41.6
BG	3.8	>or=0.75	2011	2011	18.2	9.8	0.9	low	36.9
DK	5.1	>or=0.5	2011	2013	44.4	18.2	0.2	low	55.8
EE	1.0				8.0	8.1	1.0	low	43.6
FI	3.1	>or=0.5	2011	2011	49.0	24.87	4.0	low	53.2
SE	0.9				39.4	9.3	1.8	low	55.7

Source: European Commission

As fiscal consolidation will require large adjustments, its scale, composition, timing and credibility are crucial, particularly for the short run. Should fiscal consolidation be sustained by increasing taxation or reducing expenditure cuts? How much space is left to the 2020 Strategy? In other words, the question is to what extent the achievement of climate change related goals can help or hamper fiscal consolidation. The last column of Table 10 shows the ratio of total

[48] The table is based on several European Commission documents: Council recommendation on the existence of an excessive deficit situation; European Economic Forecast – Autumn 2010; Sustainability report 2009; Public finances in EMU 2010.

taxation to GDP, as an indicator for the revenue yielded from an economy that can be seen that the high risk countries (except Slovenia and The Netherlands) have lower ratios compared to the medium and (especially) low risk Countries.

4.2 Taxation and tax composition

As average effective tax rates show that countries with high risk assessment tend to have a low tax burden, while the reverse seems true for low risk countries. However, it is very difficult to design general principles of fiscal instruments and reference points for optimal tax ratios. In the last decade new member countries adopted fiscal reforms aimed at boosting efficiency and growth, attracting foreign investments and progressively moving towards the EU average; as a consequence there is little space left for future tax increases, such as environmental related taxes. This can be said for Ireland, which in the last two decades has been characterized by the lowest corporate tax rate among EU countries but has introduced additional, specific taxes as a reaction to the financial crisis (as CO_2 tax).

Some useful insights can be drawn from tax composition and, more important in this paper, implicit tax rates. Table 11 shows that the tax burden and implicit tax rates usually increase with healthy public finances.

Table 11
Average tax share and implicit tax rates according to risk assessment

		Indirect Taxes					Direct Taxes				
Risk Assessment	Overall Tax Rate	Indirect Taxes - % of total taxes	VAT - % of total taxes	VAT - Implicit consumption tax rate	Energy Taxes - % of total taxes	Energy Taxes - Implicit tax rate	Direct Taxes - % of total taxes	Personal Income - % of total taxes	Personal Income - Implicit labour tax rate	Corporate - % of total taxes	Corporate - Implicit tax rate
High	37.1	38.1	22.6	19.5	5.0	144.2	31.3	18.0	30.6	11.0	19.5
Medium	44.1	35.5	18.4	21.4	4.7	171.3	31.2	21.6	38.2	7.7	21.4
Low	49.1	40.0	24.0	26.8	5.7	175.3	37.3	28.4	36.2	7.3	26.8

Source: Computation on Taxation Trends (2010)

The relative importance of VAT is quite similar among Member States, ask to the harmonized minimum tax level. Despite this harmonization effort, implicit tax rates increase with financial soundness.

Moreover, implicit tax rates on energy highlight considerable distance between medium and low risk countries and high risk members, even though the smallest share of energy taxes out of total tax revenue is shown by medium risk countries.

4.3 The expenditure side of the budget: general structure

In the current mature expenditure structure, there is no correlation between present public finance fragility as defined by the European Commission and the Stability Pact and the extension of the welfare state. Table 12 provides a breakdown of government expenditure, where expenditure is aggregated into six categories according to di

to the Classification of the Functions of Government (COFOG)[49]: general public services, defence, public order and safety, economic affairs, environment protection, housing and community amenities, recreation, culture and religion, education, health and social protection. The main aggregate is total general government expenditure, as shown in Table 1. Public order and public order amount to an average of 20% of total expenditure. The Economic Affairs function (which includes the previously analysed energy related subsidies) amounts to an average of 11%.

Public expenditures are mainly devoted to an average of 61% to three sectors (namely Health, Education and Social Protection), characterizing Western European welfare States. Further more, data suggest that one third of this kind of expenditure is related to Old Age protection (i.e. pensions), while the share of unemployment benefits is just of total expenditure is close to 2%. Denmark, the United Kingdom, Belgium, Germany, Sweden, France, Luxembourg and Finland spend more than 65 percent.

Table 2
General government expenditure by function (% of total expenditure) according to risk assessment 2008

Risk Assesment	01 (General public services)	02 (Defence) + 03 (Public order and safety)	04 (Economic affairs)	05 (Environment protection)	06 (Housing and community amenities) + 08 (Recreation, culture and religion)	07 (Health) + 09 (Education) + 10 (Social protection)	1002 (Old Age)	1005 (Unemployment)	Total Expenditure by country
High	12.6	8.1	13.3	2.0	5.5	58.4	16.1	1.7	100.0
Medium	14.7	5.9	9.6	1.5	4.2	64.2	22.1	2.5	100.0
Low	12.0	7.7	10.0	1.4	4.9	64.0	19.1	2.6	100.0
Unweighted Average	13.2	7.3	11.5	1.7	4.9	61.4	19.1	2.1	100.0

Source: Eurostat

Unemployment related expenditure represents an average of 2% of total public outlays, with a considerable variation among Member States. The highest values are recorded in Germany (5%), Slovenia and Spain, whereas the other countries, on the whole, generally invest less than 1%.

5. Concluding Remarks

Environmental policies, general and climate change mitigation policy in particular, have not had much space in public budgets. The share of environmental taxes as a percentage of total tax revenues has generally declined in recent years, notwithstanding some recent moves in CO_2 taxation and the potential implementation of new environmental tax reforms in several Member States. In this context, however, great impact can be expected from the third phase of the European Trading Scheme, where almost all allowances will be auctioned by Member Countries. On the expenditure side, the share of environmentally related public expenditure out of total expenditures is small in all countries, but there is a general lack of transparency that makes any appraisal of this extremely difficult. The role and

[49] Only collection of the first level of COFOG data is compulsory for Member States. This issue is one of the reasons why data are missing at the second or third level of detail.

trend of subsidies are even more controversial, because standard definitions encompassing it is still absent. From an efficiency point of view, subsidies for fossil fuels should be eliminated and resources diverted to the development and deployment of renewables.

Given that a consistent amount of resources has to be invested to implement the ambitious EU climate package, new public funds need to be raised but this requirement seems to be in conflict with constraints imposed by European coordination among Member States' public finances. Public finances in the EU are currently under stress due to the recent financial crisis and to the long-term effect of ageing populations on public budget balance. This situation sets a clear boundary to the recent EU Council agreement, which commits to an increasing EU fiscal policy credibility through supplementary public finance coordination and strengthening of the European Stability Pact. However, climate change must be faced squarely and directly and this need cannot be put aside by governments: reconciliation between financial stability and climate package needs to be reached.

A green golden rule, under which climate change related investments would be irrelevant for the definition of balance limits to be set by the European Stability Pact, may represent a reasonable way to deal with both issues.

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Glossary

Environmental Taxes

An environmental tax is a tax whose tax base is a physical unit (or a proxy of it) that has a proven specific negative impact on the environment. Following the Eurostat Statistical Guide on Environmental taxes, four subsets of environmental taxes are distinguished with the relevant tax bases. Energy taxes include levies on energy products used for both transport and stationary purposes, such as: Unleaded petrol, Leaded petrol, Diesel Oil, other energy products for transport purposes (eg. LPG or natural gas), Light fuel oil, Heavy fuel oil, Natural gas, Coal and Coke, Biofuels, other fuels for stationary use, Electricity consumption, Electricity production, District heat consumption, District heat production. As a convention, CO_2 taxes are also included here. Transport taxes are related to the ownership and use of motor vehicles and can be levied on: Motor vehicles - one off import or sales taxes,

Registration or use of motor vehicles recurrent (eg. yearly taxes. Resource taxes are related to the extraction and the subsequented depletion of natural resources and are charged on Water abstraction, Extraction of raw materials (except oil and gas) and Other resources (eg. forests). Pollution taxes are related to measured or estimated emissions to air and water, the management of solid waste and noise. In more detail, they are levied on: Measured or estimated NO_x emissions, SO_2 content of fossil fuels, Other measured or estimated emissions to air, Ozone depleting substances (e.g. CFC or halon), Measured or estimated effluents of oxydizeable matters (BOD, COD), Other measured or estimated effluents to water, Effluent collection and treatment, fixed annual taxes, Pesticides (based on e.g. chemical content, price or volume), Artificial fertilisers (based e.g. on phosphorus or nitrogen content or price), Management, Waste management in general (eg. collection or treatment taxes), Waste management, individual products (eg. packaging, beverage containers), Noise (eg. aircraft take off and landings). For further information see the Eurostat manual Environmental Taxes A statistical guide.

Implicit tax rate

The implicit tax rate, sometimes also referred to as average or effective tax rate, is calculated by dividing the gross revenues from taxes on a specific activity or good by the appropriate corresponding aggregate tax base.

Tax expenditures

According to the IMF definition (in line with the OECD one) these are revenues foregone as a result of special provisions in the tax code. They may include exemptions from the tax base, allowances deducted from gross income, tax credits deducted from tax liability, tax rate reductions and tax deferrals (such as accelerated depreciation). For further information, see the IMF Manual on Fiscal Transparency 2007 (pag. 76) or the OECD Journal on Budgeting, Vol IV, n. 2 2004 (p 130).

Direct taxes

Taxes that are levied directly by person on earl corporate income and property.

Indirect taxes

Taxes that are levied during the production stage, and not on the income and property arising from economic production processes. Prominent examples of indirect taxation are Value Added Tax (VAT), excise duties, import levies, energy and other environmental taxes.

Excise duties

Excise duties are indirect taxes on the consumption or the use of certain products. In contrast to Value Added Tax (VAT), they are main specific taxes, i.e. expressed as a monetary amount per quantity of the product.

On budget subsidies

Interventions which appear as outlays in the general government accounts, like direct financial transfers (grants to consumers / producers / processors) in favour of energy/late related services undertaken by the government.

Energy related services provided directly

The definition (in table 3) covers a broad range of interventions where the General Government directly provides

services for the benefit of energy sectors: direct investments in energy specific infrastructures, energy related R & D carried out in public (owned and funded) centres of research, and services related to the provision of liability insurance (in the case of nuclear plants) and facility decommissioning operations.

Off budget subsidies

Interventions so featuring in the balance sheet (key provision of tax expenditure (the revenue foregone may be considered in a similar light as subsidy) or benefits originating from make the regulation.

Budget balance

The balance between total public expenditure and revenue in a specific year, with a positive balance indicating a surplus and a negative balance indicating a deficit. For the monitoring of Member State budgetary positions in the EU, the general government aggregate, which covers national government, regional and local government, as well as social security funds; public enterprises are excluded, as are transfers to and from the EU budget.

Primary budget balance

The budget balance net of interest payments on general government debt.

Structural budget balance

The actual budget balance net of the cyclical component and one-off and other temporary measures. The structural balance gives a measure of the underlying trend in the budget balance.

Cyclical component of budget balance

That part of the change in the budget balance that follows automatically from the cyclical condition of the economy, due to the reaction of public revenue and expenditure to changes in the output gap (i.e. the difference between actual output and estimated potential output at any particular point in time). The potential output is the level of real GDP in a given year that is consistent with a stable rate of inflation. If actual output rises above its potential level, then constraints on capacity begin to bind and inflationary pressures build; if output falls below potential, then resources are lying idle and inflationary pressures subside. A method to estimate it is the production function approach based on available labour inputs, the capital stock and the level of efficiency.

One-off and temporary measures

Government transactions having a transitory budgetary effect that do not lead to a sustained change in the budgetary position.

Primary structural budget balance

The structural budget balance net of interest payments.

Fiscal effort

In general it is an intervention required to improve the budget position. In table 7 it represents the annual required adjustment of the General Government Budget Balance ratio to GDP for the Maastricht reference value (deficit/GDP equal or less than the threshold of 3 %) to be achieved by the countries currently under the Excessive Deficit Procedure.

Indicator S.2

Broadly, the concept of sustainability in intuitive explorers as the ability of a government to assume the financial burden of its debt current and in the future, without undertaking an explosive path. The Survey article of the sustainability of the EU Member States suggests is one of the most important tasks the European Commission undertakes (it is essential for carrying out a common monetary policy) and for this purpose certain technical tools are employed to assess States' prospects. Among them, the S_2 sustainability indicator shows the size of the permanent adjustment to the structural primary balance required to fulfil the intertemporal budget constraint, including paying for any additional expenditure arising from an ageing population.

Fulfilment of the intertemporal budget constraint implies that the discounted value of the future structural primary balance should cover the current level of debt. Mathematically:

where

- is the last year before the long-term projection;
- is the growth rate relative to GDP in t_0 (the initial level);
- is the structural primary balance relative to GDP in t;
- r is the difference between the nominal interest rate (R) and the nominal GDP growth rate (G), that is

Given the initial level of debt, the assumption of the difference and the projected path of the structural primary balance, the condition (1) may not hold, which means uncontrolled evolution of the debt. A permanent adjustment (S_2) in the structural primary balance is necessary to fulfil the constraint, that is the condition (1) becomes

and considering that S_2 is constant and (3) with the discount rate strictly positive, it follows that:

A final step required to find out the different components of this indicator is to add future structural primary balance changes with respect to the initial one, that is therefore:

where two components can be identified:

- the Initial Budgetary Position, corresponding to the gap between the initial structural primary balance and the debt stabilising primary surplus.
- the Long Term Change in expenditure, the additional adjustment required to offset the expenditure increase deriving from the ageing of the population, at the age of the LTC component depends on both the demographic outlook in each country and their respective institutional environments.

For further information, see the European Commission Sustainability Report 2009 or the European Central Bank Working Paper Series 2009 n. 944.